

REMARKS

The Office Action dated April 5, 2006, has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1-25 have been amended to more particularly point out and distinctly claim the subject matter of the invention. No new matter has been added, and no new issues are raised which require further consideration and/or search. Claims 1-26 are submitted for consideration

Claims 1, 2-4, 12, and 13-15 were rejected under 35 U.S.C. 102(a) as being anticipated by an IEEE document to Feng. The rejection is traversed as being based on a reference that neither teaches nor suggests the novel combination of features clearly recited in independent claims 1 and 12.

Claim 1, recites a method including the steps of determining a sending rate estimate, s and determining any credits or debits for a packet stream including a plurality of data packets from a source. A probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met. The method further includes the step of probabilistically marking the packet stream to one of a plurality of priority levels based on the sending rate estimate, s .

Claim 2, upon which claim 3 depends, recites a method including determining a sending rate estimate, s and determining any credits or debits for a packet stream including a plurality of data packets from a source. A probability marking of the packet

stream is improved while there is a sufficiently accumulated credit and when a first criterion is met. The method also includes probabilistically marking the packet stream to one of a plurality of priority levels based on the sending rate estimate, s . Marking includes determining if the sending rate estimate is less than a first rate threshold and in response to a determination that the sending rate estimate is less than the first rate threshold, setting a probability of marking at least one data packet with a first selected priority level is one of a plurality of priority levels.

Claim 4 recites a method including determining a sending rate estimate, s and determining any credits or debits for a packet stream including a plurality of data packets from a source. A probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met. The method also includes probabilistically marking the packet stream to one of a plurality of priority levels based on the sending rate estimate, s , wherein the step of marking includes determining if the sending rate estimate is between a first rate threshold and a second rate threshold; and in response to a determination that the sending rate estimate is between a first rate threshold and a second rate threshold, setting a probability of marking a data packet with a subordinate priority level based on s .

Claim 12 recites an apparatus including a first determining unit configured to determine a sending rate estimate, s and a second determining unit configured to determine any credits or debits for a packet stream including a plurality of data packets from a source. A probability marking of the packet stream is improved while there is a

sufficiently accumulated credit and when a first criterion is met. The apparatus also includes a marking unit configured to probabilistically mark the packet stream to one of a plurality of priority levels based on the sending rate estimate, s .

Claim 13, upon which claim 14 depends recites an apparatus including a first determining unit configured to determine a sending rate estimate, s and a second determining unit configured to determine any credits or debits for the packet stream. A probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met. The apparatus also includes a marking unit configured to probabilistically mark the packet stream to one of a plurality of priority levels based on the sending rate estimate, s , wherein the marking unit includes a third determining unit configured to determine if the sending rate estimate is less than a first rate threshold; and a setting unit configured to set a probability of marking at least one data packet with a first selected priority level to a first value, said means responsive to a determination that the sending rate estimate is less than the first rate threshold, wherein said first selected priority level is one of a plurality of priority levels.

Claim 15 recites an apparatus including a first determining unit configured to determine a sending rate estimate, s and a second determining unit configured to determine any credits or debits for the packet stream. A probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met. The apparatus also includes a marking unit configured to probabilistically mark the packet stream to one of a plurality of priority levels based on

the sending rate estimate, s , wherein the marking unit includes a third determining unit configured to determine if the sending rate estimate is between a first rate threshold and a second rate threshold and a setting unit configured to set a probability of marking a data packet with a subordinate priority level based on s , said means responsive to a determination that the sending rate estimate is between a first rate threshold and a second rate threshold.

As will be discussed below, Feng fails to disclose or suggest the elements of claims 1 and 12.

Feng teaches a differentiated services architecture where packets are classified and marked with appropriate type of service (ToS) and routers at the network core support priority handling of packets based on their ToS value. The user specifies a desired minimum service rate for a connection or connection group and communicates that to a control engine which monitors and sustains the requested level of service by setting the ToS bit in the packet headers appropriately. See at least the Introduction Section of Feng. The engine snoops a connection passing through it and measures its observed throughput. If the observed throughput is lower than the requested target, the engine marks packets belonging to the connection. The fraction of marked packets varies from zero to one depending on the measured and target throughputs. Selective marking essentially upgrades a fraction of the packets belonging to the connection to a higher level. The engine continually adjusts the fraction of packets in order to sustain a bandwidth close the

requested target rate, while keeping the number of marked packets as low as possible.

Page 687, lines 6-23.

Applicant submits the Feng simply does not teach or suggest all of the elements of claims 1, 2-4, 12 and 13-15. The Office Action continues to allege that selectively marking a fraction of the packets to a higher level, as disclosed in Feng, is equivalent to determining any credits or debits for the packet stream, wherein a probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met as recited in claims 1, 2-4, 12 and 13-15. However, Applicant submits that Feng does not teach or suggest determining any credits or debits for the packet. As noted above, Feng teaches that if the observed throughput of packets belonging to a connection is less than its requested target, the engine selectively marks a fraction of the packets (without regard to any credits or debits attributed to the packet) in the connection to upgrade the fraction of packets in order to sustain a bandwidth close the requested target rate, while keeping the number of marked packets as low as possible. In fact, Applicant submits that there is no teaching or suggestion in Feng of a packet stream accumulating credits or debits. Thus, there is no teaching or suggestion in Feng of marking packets based on any credits or debits for the packet stream. Hence, Applicant assert that the rejection under 35 U.S.C. 102(a) should be withdrawn because Feng does not teach or suggest all of the elements of claims 1, 2, 4, 12, 13 and 15 and claims 3 and 14 thereon.

Claims 1, 2-4, 12, and 13-15 were rejected under 35 U.S.C. 103(a) as being unpatentable over IEEE document to Clark in view of U.S. Patent No. 6,515,963 to Bechtolsheim. According to the Office Action, Clark discloses all of the limitations of claims 1 and 12 except for determining any credits and debits for the packet stream. The Office Action uses Bechtolsheim to cure these deficiencies and to yield the elements of claims 1, 2-4, 12, and 13-15. The rejection is traversed as being based on references that neither teach nor suggest the novel combination of features clearly recited in independent claims 1 and 12, outlined above.

Clark teaches a random early drop (RED) router with in/out bits. According to Clark, RIO maintains all of the attributes of a RED router and in addition discriminates against out packets in times of congestion.

Bechtolsheim teaches that a dynamic buffer limit is determined by look up in a pre-existing table or by live computation, indexed by parameter representing the dynamic state of an internetworking device. Col. 4, lines 55-64. The dynamic buffer limit table is computed from the router/switch state parameters. Col. 8, lines 17-20. Once the dynamic buffer limit appropriate to a received packet is determined, the packet may be tagged for further processing or enqueued. In one embodiment, a credit field is maintained in the flow table entry for each flow and is used to determine whether or not the packet is enqueued or tagged. A credit field is also maintained in the flow table for each indexed flow table entry and the credit value is incremented on enqueueing or decremented on marking or dropping. Once a flow exhausts its credits, or alternately,

reaches a minimum threshold credit level, a separate NAF limit is enforced on that flow table entry, substantially less than and replacing the dynamic buffer limit. The credits give a flow several packets to respond to the initial packet drop before the flow is classified a NAF. Col. 9, line 60-Col. 10, line 35. The Office Action states that Bechtolsheim teaches improving the probability marking of the packet stream while there is a sufficiently accumulated credit and when a first criterion is met as recited in claims 1, 2-4, 12, and 13-15. While Bechtolsheim does disclose determining any credits or debits for the packet stream as recited in claims 1, 2, 4, 12 13 and 15, Bechtolsheim does not teach improving the probability marking of the packet stream while there is a sufficiently accumulated credit and when a first criterion is met as recited in claims 1, 2, 4, 12 13 and 15. In fact, Bechtolsheim teaches that when a packet is marked, its credit value is dropped and when a flow exhausts its credit, a NAF limit is placed on the flow. Thereafter, any new packets of the flow exceeding this NAF limit will be dropped. Bechtolsheim also discloses that credits are used to give a flow several packets to respond to the initial packet drop before the flow is classified a NAF. In the present invention, on the other hand, the credit is used to **improve** the probability marking of the packet stream, to one of a plurality of priority levels, while there is a sufficiently accumulated credit and when a first criterion is met. Therefore, Applicants respectfully submit that the combination of Clark and Bechtolsheim teaches away from the teaching of that present invention and that the combination of Clark and Bechtolsheim does not teach or suggest each of the elements recited in claims 1, 2, 4, 12 13 and 15 and hence

dependent claims 3 and 14, thereon. Applicant therefore asserts that this rejection under 103(a) should be withdrawn.

Claims 1, 12 and 24-26 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,252,848 to Skirmont in view of Bechtolsheim. According to the Office Action, Skirmont discloses all of the limitations of claims 1 and 12 except for determining any credits and debits for the packet stream. The Office Action uses Bechtolsheim to cure these deficiencies and to yield the elements of claims 1, 12 and 24-26. The rejection is traversed as being based on references that neither teach nor suggest the novel combination of features clearly recited in independent claims 1 and 12 as discussed above and claims 24-26.

Claim 24 recites a computer program embodied within a computer readable medium, the computer program includes means for marking a packet stream including a plurality of data packets from a source by performing the steps of determining a sending rate estimate, s and determining any credits or debits for the packet stream. A probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met. The steps also includes probabilistically marking the packet stream to one of a plurality of priority levels based on the sending rate estimate, s.

Claim 25 recites a system for marking a packet stream including a plurality of data packets from a source. The system includes a metering tool for determining a sending rate estimate, s and a determining means for determining any credits or debits for the packet stream. A probability marking of the packet stream is improved while there is a

sufficiently accumulated credit and when a first criterion is met. The system also includes a router for probabilistically marking the packet stream to one of a plurality of priority levels based on the sending rate estimate, s .

Claim 26 recites an apparatus for marking a packet stream including a plurality of data packets from a source. The apparatus includes a metering tool for determining a sending rate estimate, s and a determining component for determining any credits or debits for the packet stream. A probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met. The apparatus also includes a marking component for probabilistically marking the packet stream to one of a plurality of priority levels based on the sending rate estimate, s .

As will be discussed below, Skirmont fails to disclose or suggest the elements of claims 1 and 12 and similarly claims 24-26.

As mentioned in our previous correspondence, Skirmont teaches a data network that includes data channels which take data from flows as input. The channels pass the data through traffic monitors to a switch which, in turn, passes the data to queues. Col. 3, line 65-Col. 4, line 3. The data in each of the flows includes a sequence of packets, each of which is marked in the corresponding traffic monitor through which the packet passes. A marking can be based on measurements taken at the traffic monitor and/or on other data including a flow profile that is associated with each flow. The flow profile includes a lower threshold and an upper threshold for the bandwidth and a packet is marked as “LOW”, “NORMAL”, or “HIGH” according to whether the concurrently measured

bandwidth is below, between or above the thresholds. Col. 4, lines 7-25. A packet is dropped in the corresponding queue based on an assigned drop probability and a random test. The probability of dropping a packet is assigned according to the average queue size and the marking of the packet, where for a packet marked as “HIGH”, “NORMAL” or “LOW”, the drop probability is determined from the corresponding marking curve shown in figure 2. Once the drop probability of a packet is determined, the packet may or may not be dropped according to a random test. If the packet is not dropped, it is enqueued. Col. 4, lines 26-37. Each traffic monitor includes an ingress monitor for each flow that is associated with the channel. The traffic monitor includes a flow ID function for identifying data packets from data flows, where packets are passed through the ingress monitor corresponding to the flow, marked by the packet marker and passed to the switch. Col. 4, lines 38-44.

Applicant respectfully submits that the combination of Skirmont and Bechtolsheim fails to teach or suggest each element of independent claims 1, 12 and 24-26. As noted in the Office Action, Skirmont fails to teach determining any credits and debits for the packet stream as recited in claims 1, 12 and 24-26. Bechtolsheim does not cure the deficiencies of Skirmont. As mentioned above, while Bechtolsheim does disclose determining any credits or debits for the packet stream as recited in claims 1, 12 and 24-46, Bechtolsheim does not teach improving the probability marking of the packet stream while there is a sufficiently accumulated credit and when a first criterion is met as recited in claims 1, 12 and 24-46. Therefore, Applicants respectfully submit that the

combination of Skirmont and Bechtolsheim does not teach or suggest each of the elements recited in claims 1, 12 and 24-26 and that the rejection under 103(a) should be withdrawn.

Claim 23 was rejected under 35 U.S.C. 103(a) as being anticipated by U.S. Patent No. 6,463,068 to Lin in view of Bechtolsheim. According to the Office Action, Lin discloses all of the limitations of claim 23 except for determining any credits and debits for the packet stream. The Office Action uses Bechtolsheim to cure these deficiencies and to yield the elements of claim 23. The rejection is traversed as being based on references that neither teach nor suggest the novel combination of features clearly recited in independent claims 23.

Claim 23 recites a method for determining probability for marking a packet a priority level. The method includes determining a first probability by using a first algorithm and determining at least one second probability by using a second algorithm. The first algorithm is different from the second algorithm. The method also includes weighting each probability so that each probability contributes to a net probability. The weighting includes determining any credits or debits for a packet stream. A probability marking of the packet stream is improved while there is a sufficiently accumulated credit and when a first criterion is met.

As will be discussed below, Lin fails to disclose or suggest the elements of claim 23.

Lin teaches a network with endstations and nodes that assign packets to classes of service based on information contained in the packets and/or on predetermined traffic management rules that are provided by the network manager and/or various service providers. The classes of service are essentially associated with maximum limits for transmission delays and probabilities of packet loss. Higher classes are associated with shorter maximum delays and lower probabilities of packet loss. Col. 3, lines 1-8. The network includes routers, each of which includes a classifier that associates a received packet with one of the classes of service. Col. 3, lines 33-35. The network also includes a policer that enforces network or service provider usage parameter controls by marking, discarding or passing the packet. If the policer marks an offending packet, it assigns the packet to a higher loss priority within the associated class of service. This increases the likelihood that the packet will be discarded if the network becomes congested. If the packet is already assigned the highest loss priority within the class of service, the policer either passes or discards the packet, depending on the traffic management rules. Col. 4, lines 1-22. A WRED processor determines which of the packets that the policer has not discarded are to be retained in a buffer that holds the packets for every output port. The WRED processor uses a modified weighted random detection scheme, where each of the classes of service is associated with a maximum threshold and a minimum threshold. The WRED processor keeps track of the average number of available storage locations in the buffer. If the buffer is empty, all of the buffer storage locations are linked to a free queue. As packets are retained, buffer locations are removed from the free queue and

linked to the appropriate class of service per output port queues. Each time a packet is received, the WRED processor determines a new weighted average free queue depth. The WRED processor compares the weighted average with the maximum threshold and the minimum threshold values associated with the appropriate one of the classes of service. If the weighted average exceeds the maximum threshold, the WRED processor retains the packet. If the weighted average falls below the minimum threshold value, the WRED process discards the packet. If the weighted average falls between the maximum threshold and the minimum threshold values, the WRED processor calculates a probability to discard. Col. 4, line 39 – Col 5, line 26.

Applicant respectfully submits that the combination of Lin and Bechtolsheim fails to teach or suggest each element of independent claim 23. As noted in the Office Action, Lin fails to teach determining any credits and debits for the packet stream as recited in claim 23. Bechtolsheim does not cure the deficiencies of Lin. As mentioned above, while Bechtolsheim does disclose determining any credits or debits for the packet stream as recited in claim 23, Bechtolsheim does not teach improving the probability marking of the packet stream while there is a sufficiently accumulated credit and when a first criterion is met as recited in claim 23. Therefore, Applicants respectfully submit that the combination of Lin and Bechtolsheim does not teach or suggest each of the elements recited in claim 23 and that the rejection under 103(a) should be withdrawn.

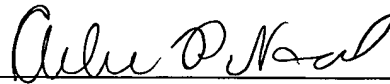
The Office Action states that claims 5-11 and 16-22 are allowable. Applicant thanks the Examiner for indicating that these claims are allowable. Claims 5-11 and 16-22 have been amended to more particularly point out and distinctly claim the subject matter of the invention. No new matter has been added, and no new issues are raised which require further consideration and/or search. Thus, Applicant requests that these claims be allowed.

As noted previously, each of claims 1-26 recites subject matter that is neither disclosed or suggested in the cited prior art references. It is therefore respectfully requested that all of claims 1-26 be allowed and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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